

of which were determined, eighty-three; verified, seventy, or 84.34 per cent. Seven signals were ordered, the verifications of which it was impracticable to determine.

In addition to the above, in two hundred and six instances, the signals ordered from this office were repeated by the observers at the regular stations to towns in their vicinity. The verifications of these it was impracticable to determine.

LOCAL VERIFICATIONS.

The following is from the April, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 86 per cent. for weather and 78 per cent. for temperature; for eastern Dakota, 93 per cent. for weather and 90 per cent. for temperature; for northern Iowa, 83 per cent. for weather and 85 per cent. for temperature.

The following is from the "Michigan Crop Report" for April, 1887:

Weather and temperature signals are now displayed in one hundred and ten cities and towns in Michigan. The predictions of weather and temperature have been verified 78.6 per cent. for this month.

Weather signals carried on the Chicago and Grand Trunk Railway; Detroit, Grand Haven and Milwaukee Railway; and the Port Huron and Northwestern Railway have been found to supply a long-felt want, and are received with great favor by the agricultural districts through which these roads pass.

The predictions of weather and temperature have been verified as follows: Chicago and Grand Trunk Railway, 77.2 per cent.; Detroit, Grand Haven and Milwaukee Railway, 79.6 per cent.; and the Port Huron and Northwestern Railway, 83.2 per cent.

Two cold-wave signals were ordered this month, both being verified. The one of the 4th and 5th was the most prominent. The signal was ordered at 12.45 a. m. of the 4th, temperature at 62° 6, and at 7 a. m. the temperature read 35° 4, and reached the minimum, 19° 1, at the central office on the morning of the 5th, twenty-four hours after the signal was ordered displayed. The range of temperature was 40° 7 in less than eight hours from the time the temperature began to fall. Frosts were reported all over the state on the morning of the 5th, and would undoubtedly have caused much damage to agriculture if this warning had not been thus spread throughout the state, enabling all interested to protect their crops.

The "South Carolina Weather Review" of April, 1887, says:

The percentage of verification of weather and temperature predictions for the whole state was: for weather, 93.0 per cent.; for temperature, 89.8 per cent.

STATE WEATHER SERVICES.

The following extracts are republished from the reports for April, 1887, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The dry condition of the weather has continued through April and vegetation has suffered materially. Most of the rain reported by the observers for the month fell during the 18th, 22d, and 23d, and the earth was so dry the moisture was immediately absorbed, leaving in a few hours but little trace of the precipitation. For this state the April precipitation was 4.09 inches below the average. The temperature has been very nearly normal, and no great extremes were reported from any quarter.

The state has been remarkably free from violent storms of wind; only one, on the 22d, was reported during the month, and it was quite limited in its destructive effects. At Tusculumbia, on that date, a thunder-storm set in at 1 p. m. with a succession of clouds during the day, followed at 3 p. m. by a severe wind storm blowing with gale force, and demolishing fences, etc. Thermometer, 62°. Hail in great quantity, nearly covering the ground; hail-stones very large, some quite irregular in shape. Leaves stripped from the trees and torn in shreds. This storm did much damage to grape vines. A large number of window glass was destroyed. The damage from the hail is supposed to be as much as \$500 to \$800.

Summary.

Mean temperature, 64°; highest temperature, 90°, at Troy, on the 30th; lowest temperature, 24°, at Gadsden, on the 6th; range of temperature, 66°; greatest monthly range of temperature, 64°, at Gadsden; least monthly range of temperature, 36°, at Greenville; mean daily range, 23° 7; greatest daily range of temperature, 46°, at Gadsden, on the 11th; least daily range of temperature, 8°, on the 7th, at Demopolis; mean depth of rainfall, 2.20 inches; mean daily rainfall, .073 inch; greatest depth of monthly rainfall, 3.99 inches, at Carrollton; least depth of monthly rainfall, 0.95 inch, at Greenville; greatest daily local rainfall, 2.88 inches, at Carrollton, on the 22d.

Average number of days on which rain fell, 4; average number of cloudy days, 5; average number of fair days, 6; average number of clear days, 19.

Warmest day, 12th; coldest day, 6th.

Prevailing direction of wind, southwest.

The "Arkansas Weather Service," Mr. George R. Brown, of Little Rock, director:

Frosts were reported on the 1st from Fort Smith, Lead Hill, Portia, Conway, and Palarm; on the 5th at Fort Smith, Little Rock, Lead Hill, Palarm, Eureka Springs, and a general light frost on the 24th over almost the entire state as far south as Helena and Texarkana, and very cold at Mariana on the 18th and Judsonia on the 27th.

A light snow fell at Fayetteville the night of the 17th, and the temperature the morning of the 18th was 38°.

The rainfall was less than the average, the deficiency being greatest in the central and southern parts of the state, where it was 5 inches less than the average; in the northern and northeastern portions it was about 2 inches less than usual. Two cold waves passed over the state, one entering at the extreme northwest on the night of the 3d, reached the central portions by the night of the 4th, and crossed the entire state by the night of the 5th. The other continued irregularly over the state from the 23d to the 27th.

The highest reported temperatures in the state were 95°, at Dallas; 94°, at Fayetteville; 93°, at Conway and Palarm; 92°, at Brinkley and Russellville, and 91°, at Alexander and Fort Smith. The lowest were 26°, at Palarm; 27°, at Fayetteville and Lead Hill; 28°, at Eureka Springs, and 29° at Russellville.

The greatest amount of rain was at Lead Hill, 3.02; the least, at Conway, 0.10 inches.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

The noteworthy meteorological features of the month of April were the continued drought from the 1st to the 17th; the remarkable maximum temperature, 95°—the highest since observation began; the cyclonic storm of the 22d, and the unusual number of high winds reported.

Temperature.—The mean temperature of the state for April, 53°, was 1° 5 above the April normal for the past thirteen years; April, 1878, with a mean temperature of 56° 1, was the warmest, and April, 1881, 45° 3, was the coolest. The mean temperature of the northern counties, 50° 1, was 1° above the April normal; the mean of the central counties, 53°, was 0° 6 above, and of the southern counties, 56° 8, was 0° 3 above the April normal. In the southern counties reporting, excepting Madison, Saint Clair, Pope, and Alexander, the mean temperatures were below the normal; but the very marked departures above the normal in the two first-named counties caused the average departure to exceed the normal by less than one-third of a degree.

A considerable decrease in the range of the monthly mean temperature from the northern to southern extremities is noted. The lowest monthly mean reported was 44° 2 from Lake Forest, Lake Co., and the highest, 60° 9, from Benton, Franklin Co., a range of 16° 7 for the state.

The highest temperature, 95°, is noteworthy as being the highest on record for April. It was reported from Jordan's Grove, Randolph Co., on the 13th. The lowest temperature, 5°, was reported from Galena, Jo Daviess Co., on the 4th. The dates of the occurrence of maximum temperature were from the 12th to the 14th for the state, and of the minimum on the 4th and 5th in the northern and central counties, and the 1st and 5th in the southern counties, with but few exceptions.

Precipitation (inches and hundredths).—A drought prevailed from the 1st to the 16th of the month, broken by general rainfall on the 17th, that was light in the northern counties, and heavy in the central and southern counties. From the latter date to the end of the month light rains were frequent in the northern counties, moderately heavy in the central counties, and heavy in the southern counties.

The average precipitation for the state for the month, 2.52, was 0.78 below the April normal for a term of ten years. The greatest average April precipitation during that period was 4.17, occurring in 1883, and the least, 2.02, in 1879. The average for the northern counties, 1.13, was 1.81 below the April normal for ten years; for the central counties, 2.69, was 0.56 below, and for the southern counties, 3.97, was 0.13 above.

From the following table it will be seen that the average April precipitation for the state has a range of nearly one inch from the northern to southern parts of the state, a gradual increase going south:

Territory.	April.									
	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.
Northern counties.....	3.72	2.14	4.13	1.80	4.31	3.18	2.64	3.59	2.71	1.13
Central counties.....	3.54	1.47	3.99	2.36	4.14	4.61	2.23	4.98	2.46	2.69
Southern counties.....	5.20	2.46	3.24	3.31	2.81	4.73	3.57	4.87	4.26	3.97
The state.....	4.15	2.02	3.79	2.49	3.75	4.17	2.81	4.05	3.20	2.52

The area of the state receiving a monthly precipitation of from three to six inches is bounded on the north by latitude 39° 30', and on the south by 37° 20', the heavy rainfall of the 17th and 21st-22d affecting that section most.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The mean temperature was slightly below the normal, but the difference did not amount to a degree, except in one instance. The warmest day was the 13th and the coldest the 5th, the range being from 90° at Marengo, Butlerville, and Delphi to 18° at Columbia City.

The rainfall was above the average except at Logansport, Lafayette, and Worthington. The greatest excess was at Vevay, where it was 3.67 inches, and Blue Lick, where it was 2.70 inches above the normal. A heavy snow storm passed over the northern and central portions of the state on the 18th, accompanied by very heavy rain in the southern portion. Remarkably heavy rain fell on the 22d in the central and southern counties, 6.77 inches being reported at Marengo, 3.67 inches at Vevay, and 3.36 at Blue Lick. At Vevay the total rainfall during the storm was 4.35 inches in thirty-two hours. The observer at Princeton reports that during this storm a tornado passed over the northern part of Gibson county, which did considerable damage, while the observer at Mount Vernon reports high winds that unroofed buildings and did other damage, and that the heavy rain caused the Ohio to overflow its banks in that neighborhood. The observer at Blue Lick reports the rainfall of the 22d the heaviest of which there is any record.

The observer at Angola reports that in his neighborhood wheat is suffering from lack of rain, and that the dry, hot weather of the early part of the month killed a great deal that had been partially dragged from the ground by the frost.

The "Kansas Weather Service," Mr. J. T. Lovewell, Topeka, director:

The mean temperature has ranged above the average for April throughout the state. The precipitation has exceeded the average for April in the western counties, while in the middle and eastern counties it has been deficient, except in Douglas county, where it 0.14 inch above. Rain or snow, in measurable quantities, fell twelve days; the heaviest falls occurred on the 12th in the western counties, and on the 17th in the central and eastern counties.

In the vicinity of Independence chinch bugs were unusually numerous, especially on the 2d, 6th, 7th, and 28th, and did serious damage to wheat, oats, etc.

The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

Temperature.—The temperature for April is only 0°2 below the normal, as obtained from a series of readings extending from five to nineteen years. The mean for central and southern portions is 1°3 below the normal. The range of temperature has been above the average, the absolute range being 84°, but on the whole the daily mean has been above freezing, and although frosts have been reported on nearly every day of the month in different portions of the state, yet no material damage has resulted from this range.

Precipitation.—The precipitation for this month is 0.96 inches below the normal for the state. While the northern portion is above the normal the central and southern portions are considerably below the usual precipitation for this month, the southwestern part receiving the lightest fall.

The snowfall has been light except on the upper peninsula where very heavy snow fell on the 3d and 4th. The snow that fell melted rapidly and did not remain on the ground over twenty-four hours at any time in the southern portions. Snow is reported on the ground at Keweenaw Point only. The snowfall for the month on Keweenaw Point is reported from Central Mine as 54 inches, this is estimated. For the lower peninsula the snowfall for the month, as based on reports received from thirteen stations, has been from 0.5 to 3.3 inches.

Summary.

Mean monthly temperature, 42°8; highest temperature, 82°, on the 12th, at Athens; 13th at Benton Harbor and Hudson; lowest temperature, —2°, on the 4th, at Grayling; monthly range of temperature, 84°; greatest range of temperature, 80°5, at Grayling; least range of temperature, 41°2, at Central Mine.

Average precipitation, 1.38 inches; average number of clear days, 7.8; average number of fair days, 13.8; average number of cloudy days, 8.4; average number of rainy days, 8.9.

Prevailing direction of wind, southwest; maximum velocity of wind and direction, forty-eight miles, southwest, at Port Huron.

The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was notable for heavy gales of wind, a temperature slightly above the normal, and severe thunder-storms. In southern Minnesota seeding of small grain was generally finished at the close of the month, although delayed a few days by the heavy rains. Vegetation which had appeared above ground received a severe check from the cold weather of the 25th and 26th. Seeding was also well advanced in the northern counties; it commenced at Park Rapids on the 8th. In many districts plowing for corn has begun.

Temperature.—The mean, as deduced from the reports of the stations of the Minnesota Weather Service, is 44°1, which is 8°4 below that of the corresponding month of 1886, and 1°5 above that of 1885. This is slightly above the normal, except in the northeastern portion of the state. At Duluth the mean was 1°2 below the average of the corresponding month for seventeen years, while at Saint Paul it was 6°7 above; Saint Vincent, 2°3 above; Moorhead, 1°4 above, and La Crosse, 0°6 above. But one decided cold wave passed over the state, and that was on the 4th and 5th; the lowest temperature for

the month was 3°6 below zero, and occurred at Saint Vincent on the former date. On the 25th and 26th there was a slight cold wave in which the temperature fell below freezing. The periods of highest temperature were mainly from the 8th to 10th, 29th, and 30th. In the northeastern portion of the state the maximum for the month occurred during the former period, while elsewhere it occurred on the 30th, when the temperature was abnormally high; the highest reported was 88°, at Sherburne and Morris, on the 30th. The monthly range of temperature for the state was 91°6, which is 6° greater than for the same month of 1886, and 16° greater than in 1885. The greatest ranges were reported from the Red River Valley; at Saint Vincent it was 87°1, and Grand Forks, 84°0; the least ranges were Saint Cloud, 66°0; Red Wing, 67°0, and La Crosse, 67°6.

Precipitation (in inches).—The average for the state was 2.23, which is 1.43 less than that for the same month last year. It was rather unevenly distributed, as there was an excess of 0.89 at Saint Paul and 0.21 at Saint Vincent; at Duluth there was a deficiency of 0.63, while at La Crosse it was about normal. The periods of general precipitation were from the 2d to 4th, inclusive, 11th to 14th, 22d to 24th, 27th and 28th. The greatest daily amount fell during the prevalence of thunder-storms in the second of these periods in the northern and western portions of the state; elsewhere the greatest amount fell during the third period. Lunar halos were generally observed before all of these storms, excepting that from the 22d to 24th. Occasional snow fell during the early portion of the month, but rapidly disappeared from the high temperature which followed. The greatest monthly rainfalls reported were Rolling Green, 4.10; Rochester, 3.41; Delano, 3.23.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Reports from fifteen different sections show that there has been a great deficiency of rainfall over the state during the past month, which has retarded the crops to some extent, although the weather has been very favorable for preparing the ground. Corn and cotton are fairly advanced in most sections, and the crop prospects are ten per cent. better in the southwestern portion of the state than they were this time last year. Fruit has been very much injured by frost in the northern part of the state; season advanced.

Mean temperature, 66°; highest, 93°, on the 30th, at Greenville and Waynesborough; lowest, 32°, on the 5th, at Batesville; range of temperature, 61°.

Mean depth of rainfall, 1.82 inches; greatest rainfall, 3.35 inches, at Starkville; least rainfall, 0.95 inch, at Biloxi; average number of days rain fell, 4.5; rainy days, 1st, 3d, 4th, 7th, 8th, 17th, 18th, 21st, 22d, 23d, 24th, 25th, 28th. The rainfall at Vicksburg was 6.9 below the average; at Artonish Plantation there was less rainfall than in any April for the last ten years. Total rainfall for the month, 1.52 inches; for this month last year, 8.03 inches. High wind and terrific thunder, lightning, and rain at Palo Alto on the 22d.

A destructive hail storm occurred at Rolling Fork and Yazoo City on the 21st, doing much damage to growing crops.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

The mean temperature for the past month has been 1°7 above the average, or 57°9, a common April temperature for Saint Louis. The highest temperature was 86°5 on the 13th, which is the highest April temperature observed for several years. The lowest was 33°0, and was observed on the 4th.

The rainfall at the central station was 1.80 inches in excess of the normal, which is 3.70 inches. No rain fell during the first half of the month, the weather being generally clear. A large amount of rain fell on the 16th, 17th, and 18th, over three inches falling in about thirty-six hours. Another fall of 1.61 inches occurred on the 22d. A quantity of snow fell on the morning of the 18th, lasting about three hours.

The highest temperatures reported from the state are, 90° from Miami and Springfield; 89° from Louisiana; 88° from Oregon, Sedalia, and Steelville; and 87°5 from Fayette. The lowest temperatures were, 19°5 from Fayette; 20° from Ironton; 22° from Kirksville; 24° from Louisiana, Sedalia, and Troy; and 25° at Oregon and Hustonia. None of the low temperatures reported from the state are above the freezing point.

The greatest amount of rain fell in the vicinity of Saint Louis, Troy reporting the greatest, it being over six inches; the next highest fall occurred at the central station. In the central part of the state the fall was from three to four inches, diminishing to less than one inch in the northern part. In the southern part the fall was from two to three inches.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The abruptness with which winter passed away a year ago and summer began has again been repeated; this time, however, being nearly a month in advance of last season. Last year a cold snowy March was followed by a normal April; this year a normal March has been followed by a warm April—in both cases the month of April has been dry; this April has been the driest but one for ten years, and the warmest except two.

Precipitation.—The rainfall for the month has varied from less than one inch in the northeastern counties to a little over four inches in the central part of the state, reaching its maximum in the northern part of Buffalo county. The average for the entire state is a little over two inches; the greater part of it fell during the storm which moved northward from Texas on the 12th and 13th. The number of days on which some rain fell has, however, been up to the normal for April.

Temperature.—The mean temperature for the month has been 53°5 against

an average of 50°·8 for past Aprils. The noon temperature has in like manner averaged about 3° above the normal. The highest temperature of the month, 93°, was exceeded only in 1883, when it was 95°. The lowest for the month, 13°·6, was exceeded only in 1879, and also in 1881, when it fell to 6°. It has therefore been a month of extremes in temperature.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and fifty observers. The average temperature for the month is decidedly below the normal, all stations of ten or more years' record, twenty-five in number, having a lower mean than usual, while some of the northern averages are 3° or 4° too low. The precipitation is also generally in excess of the normal, but in this case the most marked feature of the month was the excessive fall of snow. The past winter has been, as a whole, characterized by unusual snow.

Thunder-storms.—Lightning was reported from several stations in Connecticut, Rhode Island, and southeastern Massachusetts during the snow storm on the evening of the 18th, generally without thunder. Thunder was heard at a few points on the 24th and 28th. The 29th brought summer-like thunder-storms in the afternoon to southern New England. At Cambridge the morning had been fair with clouds drifting from the northwest, and by noon large cumulus masses appeared in the south and west; a cool, east breeze had sprung up a little earlier, and in the afternoon became a well-developed "sea-breeze," or chilly, east wind, bearing fog, in which the storm clouds were soon hidden. Hail fell in the shower of this storm, and lightning struck in Lunenburg, Mass. This storm seems to have been associated with the central passage of the last cyclone of the month over southern New England.

Sea breeze.—The change of seasons and the approach of summer are marked by the appearance of the sea breeze along the coast, as well as by the fewer and more moderate barometric oscillations and the more regular diurnal variations of temperature and the increase in the number of thunder-storms. As the attention of some of the society's observers will be especially directed to the phenomena of the sea breeze during the coming summer, the following notes are presented concerning its occurrence on April 21st and 24th:

On the 21st the sky was clear; the atmospheric pressure was about normal and of generally uniform distribution over the eastern third of the United States; and the winds were light. At our interior stations the range of temperature from the morning minimum to the noon maximum was large, and the noon was mild or warm; thus, the maximum was 66° at Milford, 60° at Framingham, 67° at Lake Cochituate, 62° at Concord, Mass. At Brattleborough, Vt., a thermograph record showed a rise from 27° at 5 h. 40 m. to 61° between 13 h. and 14 h., falling again to 32° on the early morning of the 24th. But at our coast stations a cool breeze came in from the sea and kept the temperature below 60°; the maximum was 54° at Boston, 53° at Lynn, and 57° at Newburyport; at Cambridge a thermograph recorded a rise from 35° at 5 h. 15 m. to 54° at 11 h. 30 m., when the easterly sea breeze arrived and prevented a warming of more than 1° or 2° through the afternoon till the evening fall of temperature followed the moderate maximum of 55° at 17 h. 15 m. At Chestnut Hill the thermograph curve rose from 29° at 6 h. to a maximum of 58° between 14 h. and 15 h., when a gradual fall began. From this it appears that the breeze was limited to a narrow belt along the coast, and that it made its way inland rather slowly.

On the 24th there was a light west or northwest wind in the morning and, except immediately along the shore, the sea breeze did not appear till late in the afternoon, so that the records of maximum thermometers failed to detect it. The inland maxima were 60° at Milford, 63° at Framingham, 68° at Lake Cochituate, 66° at Concord, Mass., and near the sea shore, 63° at Chestnut Hill, 68° at Cambridge, 64° at Boston, 59° at Lynn. At Cambridge the temperature began to fall slowly at 15 h. 40 m., and decreased rapidly after 16 h. 25 m., when the sea breeze was distinctly felt; at Chestnut Hill the first cooling began at 16 h. 10 m., and between 17 h. 35 m. and 18 h. the temperature fell from 59° to 50°, showing as before the gradual inland progression of the breeze.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

"April borrows three days from March and they are ill," says the proverb. This year it was a beggar from all the months in the calendar. The month opened with a regular winter snow storm, and for a day or two we were shivering with cold and ankle-deep in snow and slush, the result of a storm-centre moving along the coast from the Gulf. This was followed by high winds and a "cold wave" that gave us our minimum temperature for the month, on the 5th and 6th. The "cold snap," however, was of short duration, and by the 10th the wind had backed to the south under the influence of a storm-centre passing over the Lakes, and winter clothing became very uncomfortable. The range of temperature on the first twelve days of the month was great, running from the twenties, on the 5th and 6th, to the eighties, on the 10th and 11th, when the maximum occurred. The month as a whole could not be called cold, but it was unlike the April of last year or the year before.

The mean temperature of the state for the month, as compared with normals determined from past records at twelve stations, was found to be nine-tenths of a degree below the mean.

The rainfall for April was generally below the normal. Twelve stations show an average deficiency of ninety-four hundredths of an inch.

Four thunder-storms during the month were reported. The first on the 10th at New York City and Union. An area of low pressure on this date prevailed

on the Lakes. The second, on the 18th, was quite generally observed, and hail fell at most stations. This may be attributed to the approach of a low barometer on our southern border from Virginia. It struck the Gulf Stream about midnight of the 18th. The third, on the 23d, resulted from quite a low barometer (29.10) passing from Arkansas by way of the Lakes to Canada on that date. The fourth, reported at three stations, Beverly, Clayton, and Egg Harbor City, on the 26th, was no doubt due to the disturbances caused by a remarkably rapid movement along our coast of a storm-centre which affected our weather conditions on the 26th and 27th.

Twenty-eight stations report rain or snow to have fallen on an average of seven days out of the thirty.

Fifteen stations report an average of twelve days on which the cloudiness was equal to or exceeded eight on a scale running from zero to ten. Atlantic City, Bordentown, New York, South Orange, and Union enjoyed the most sunshine.

The "North Carolina Weather Service," Dr. Charles W. Dabney, jr., of Raleigh, director:

The first thirteen days of the month were remarkable for a general absence of rain followed by a series of thunder-storms commencing on the 15th, and generally distributed throughout the state and adjacent territory. These storms continued at intervals of three or four days until the end of the month; at many points hail remarkable for size and quantity fell. Except at Tarborough, where a few houses were damaged by wind and lightning, no serious casualties can be traced to these storms.

Summary.

Temperature.—Mean temperature of the month, 57°·1; normal mean for April, 57°·5; highest temperature, 93°·0, on the 12th, at Maxton; lowest temperature, 24°·0, on the 6th, at Marion; average morning temperature, 48°·4; average afternoon temperature, 67°·8; average night temperature, 55°·9; mean of maximum temperature, 86°·3; mean of minimum temperature, 30°·1; greatest daily range, 52°·0, at Maxton, on the 11th; least daily range, 2°·1, at Raleigh, on the 1st; greatest monthly range, 65°·0, at Davidson College, Marion, and Maxton; least monthly range, 38°·9, at Hatteras.

Precipitation (inches).—Average for the state, 2.87; normal average for April, 4.51; greatest monthly rainfall, 4.64, at Maxton; greatest daily rainfall, 2.80, at Lenoir, on the 22d; least monthly rainfall, 1.85, at Wake Forest; heavy rainfalls, exceeding one inch, occurred on the 1st at Hatteras and Wilmington; on the 22d at Salem and Lenoir; on the 23d at Marion; on the 25th at Raleigh, Maxton, Chapel Hill, Salem, and Reidsville.

Record of sunshine at Experiment Farm, two miles west of Raleigh, N. C.

Date.	Number of hours of possible sunshine.	Number of hours recorded by instrument.	Degree of intensity.	Time (75th meridian) of day during sunshine.	Possible sunshine recorded.	Character of weather.
1887.						
April 1	h. m.	h. m.			p. ct.	
2	12 40	0 0		Obscured	0	Snow.
3	12 41	9 0	Bright	8.45 a. m. to 5.45 p. m.	71	Clear.
4	12 44	8 45	do	8.45 a. m. to 5.30 p. m.	67	Clear and hazy.
5	12 46	8 45	Very bright	8.15 a. m. to 5 p. m.	67	Clear.
6	12 49	9 0	do	8.45 a. m. to 5.45 p. m.	70	Do.
7	12 51	8 30	do	8.30 a. m. to 5 p. m.	66	Do.
8	12 54	8 0	do	10 a. m. to 6 p. m.	62	Fair.
9	12 57	8 45	Bright	9.15 a. m. to 6 p. m.	68	Clear and hazy.
10	13 1	9 0	Very bright	8.30 a. m. to 5.30 p. m.	69	Do.
11	13 3	9 15	do	8.30 a. m. to 5.45 p. m.	71	Do.
12	13 6	9 45	do	8.15 a. m. to 6 p. m.	74	Do.
13	13 8	9 15	do	8.30 a. m. to 5.45 p. m.	70	Do.
14	13 11	6 15	Very faint	9.15 a. m. to 4.30 p. m.	47	Do.
15	13 13	0 0	Obscured	Obscured	0	Cloudy.
16	13 16	2 30	Very faint	2.15 p. m. to 2.45 p. m.	19	Cloudy and hazy.
17	13 18	9 15	Very bright	9 a. m. to 6.15 p. m.	70	Clear and hazy.
18	13 21	4 30	Faint	8.15 a. m. to 12.45 p. m.	34	Fair and rain.
19	13 23	6 0	do	9.30 a. m. to 11.45 a. m.	45	Do.
20	13 26	10 0	Very bright	2.45 p. m. to 6.30 p. m.	74	Clear.
21	13 28	3 0	Very faint	8.15 a. m. to 6.15 p. m.	22	Fair.
22	13 31	9 15	Very bright	8.15 a. m. to 11.15 a. m.	68	Clear.
23	13 33	3 30	Very faint	5.15 a. m. to 5.30 p. m.	26	Fair and rain.
24	13 39	6 45	do	2 p. m. to 5.30 p. m.	50	Cloudy.
25	13 38	9 30	Faint	9.45 a. m. to 4.30 p. m.	70	Fair.
26	13 41	0 0	Obscured	8.45 a. m. to 6.15 p. m.	0	Cloudy and rain.
27	13 43	10 15	Faint	Obscured	75	Clear.
28	13 46	8 45	Bright	9.15 a. m. to 6 p. m.	64	Fair and rain.
29	13 48	4 45	Faint	8.15 a. m. to 6 p. m.	34	Cloudy & rain.
30	13 50	9 45	Bright	Various intervals	72	Clear and rain.
31	13 52	10 0	Very bright	8 a. m. to 6 p. m.	72	Clear.
Average	13 16	7 4			53.2	

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

Generally fair weather prevailed throughout the state until the 14th, with light local rains on the 4th and 7th, and scattering showers on the 3d and 5th. During this interval the temperature steadily rose, except on the 5th, when a cold wave was recorded.

Local rains on the 14th were followed by a general storm on the 15th. The latter was accompanied in many places by light winds, and yielded tornadoes in the southeastern part of the state. From the 16th to the 30th generally

stormy weather prevailed, heavy rains occurring on the 17th and 18th, on the 22d and 23d, and on the 28th, with local rains on all other days between the dates given. The storm of the 15th was followed by a fall of 16° to 21° in temperature throughout the state.

The mean temperature was 49°.8, 0°.7 above the average, and 0°.48 below the mean for the state. The mean temperature for the northern section shows the influence of the Lakes, the figure being 46°.8, as against 50°.1, and 51°.8 for the middle and southern sections, respectively. The mean daily range of temperature was rather high, being 24°.5, 2°.7 above the average.

The mean rainfall was 3.83 inches, 0.9 inch above the average and 0.24 above the mean. The average depth for the northwestern section was 2.35 inches, for the middle section 3.56, and for the southern section 5.81. The greatest rainfall was 8.28 inches at Georgetown, the least, 1.13, at Oberlin.

Mean temperature, 49°.8; highest temperature, 90°.0, on the 12th and 13th, at Pomeroy; lowest temperature, 10°.0, on the 19th, at Findlay; range of temperature, 80°.0; mean daily range of temperature, 24°.5; greatest daily range of temperature, 57°.0, on the 11th, at Findlay; least daily range of temperature, 1°.0, on the 16th, at Wooster.

Average number of clear days, 10.2; average number of fair days, 12.9; average number of cloudy days, 6.9; average number of days on which rain fell, 9.4. Greatest number of days on which rain fell, 18, at Ellsworth; least number of days on which rain fell, 5, at New Bremen. Mean monthly rainfall, 3.83 inches; average daily rainfall, 0.128 inch.

Prevailing direction of wind, southwest.

The "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

The mean temperature of the month was slightly below the normal; while there were several warm days, notably the 11th, 12th, and 13th (when the maximum temperature ranged from 85° to 94°) the nights and mornings were generally cool. At Charleston the mean temperature was 62°.6, or 1°.7 below the mean of the last sixteen years.

The rainfall was also below the average, and was rather unevenly distributed, the central counties and the immediate coast districts receiving the greatest amounts. At Charleston the total precipitation was 3.53 inches, or 0.92 inch less than the average of the last sixteen years.

Heavy frost, causing some damage to fruit and vegetables, occurred throughout the state on the 2d. Frost also occurred in the upper and middle counties on the 1st, 3d, 6th, 9th, and 26th, and in the upper counties only on the 5th, 10th, 11th, 20th, 21st, 25th, 27th, and 30th.

Summary.

Mean temperature, 62°.3; highest temperature, 94°, at Winnsborough, and at Bennettsville, on the 12th; lowest temperature, 28°, at Winnsborough, on the 2d, and at Spartanburg, on the 6th; range of temperature, 66°; greatest daily range of temperature, 45°, at Brewer Mines, on the 11th; least daily range of temperature, 2°, at Stateburg on the 1st.

Mean depth of rainfall, 2.09 inches; greatest monthly rainfall, 4.47 inches, at Bennettsville, Marlborough Co.; least monthly rainfall, 0.79 inch, at Holland's Store, Anderson Co.; greatest daily rainfall, 1.90 inches, at Charleston, on the 1st; date of heaviest general rainfall throughout the state, 25th.

Rainfall exceeding one inch was reported as follows: Belfast, 1.73 inches, on the 15th; Bennettsville, 1.07 inches, on the 20th; Belfast, 1.37 inches;

Bennettsville, 1.10; Hampton 1.10, on the 25th. Least daily rainfall, inappreciable, at several stations, on the 1st. Average number of rainy days, 5.4.

The "Tennessee State Board of Health Bulletin," under the direction of J. D. Plunkett, M. D., President of the State Board of Health (the weather report is prepared by H. C. Bate, Director of the State Meteorological Service):

The principal features for April were the high winds which prevailed at intervals during the month, severe thunder-storms, and the very small amount of rainfall during the first part of the month.

The mean temperature was 59°.13, slightly above the mean of the month for the past five years. The highest recorded was 93°, on the 8th, and was the highest reported in April during the past five years. The lowest was 21°, on the 6th, and was very near the mean minimum for the period above mentioned.

The mean precipitation was 2.86 inches, the least for April during the past five years, except in 1885, when the mean was 2.75 inches, much below the normal for April. The amount was greatest in the eastern division, which received an average of nearly four inches; the middle division receiving an average of nearly two and a half inches, and the western division but little over two inches.

The rainfall was heaviest in the extreme northeastern portion of the state; the greatest being 5.76 inches, reported at Rogersville. The day of the greatest rainfall was the 22d, when the fall was very heavy in the eastern division, particularly in the southwestern portion; Parksville reporting 2.47 inches, and Chattanooga 2.36 inches, the greatest local daily falls reported. Most of the rains, however, were light, and only a few were general, notably on the 4th, 7th, 17th, 18th, 22d, and 27th. From the 17th to the 28th, inclusive, rains were frequent, but mostly light and local. There were twelve days on which no rain was reported. There was no snowfall reported during the month.

There were two cold-wave warnings received and distributed: 3d-5th and 23d-24th; the predictions of both being fully verified.

Dews were reported on about ten days during the month. Although dry during the early part of the month, the frequent showers during the latter portion had a very beneficial effect on vegetation, which advanced rapidly toward perfection.

Summary.

Mean temperature, 59°.13; highest temperature, 93°, on the 8th, at Dyersburg; lowest temperature, 21°, on the 6th, at Andersonville; range of temperature, 72°; monthly mean range of temperature, 56°; greatest monthly range of temperature, 66°, at Andersonville and Hohenwald; least monthly range of temperature, 44°, at Covington; mean daily range of temperature, 21°.6; greatest daily range of temperature, 44°, on the 2d, at Hohenwald; least daily range of temperature, 3°, on the 17th, at Rogersville, on the 18th, at Covington, and on the 27th, at Florence Station and Vernon; mean of maximum temperatures, 87°.13; mean of minimum temperatures, 30°.83.

Mean depth of rainfall, 2.86 inches; mean daily rainfall, 0.095 inch; day of greatest rainfall, 22d.

Average number of days on which rain or snow fell, 7.3; average number of clear days, 16.8; average number of fair days, 8.1; average number of cloudy days, 5.1.

Days without rainfall, 1st, 2d, 3d, 5th, 6th, 9th to 14th, 30th.

Warmest day, 13th; coldest days, 1st and 15th.

Prevailing wind, southwest.

NOTES AND EXTRACTS.

RAIN FREQUENCY AND WIND ROSE FOR APRIL.

[Prepared by 1st Lieut. H. H. C. Dunwoody, 4th Artillery, Acting Signal Officer and Asst.]

Chart number vii, for April, shows the relative frequency of rain at the principal stations, the reduced scale of the chart rendering it impossible to represent diagrams from all stations, and therefore only stations were selected which would indicate the general character of rain-winds for each district. The original data from which these charts were computed consist of the number of rains preceded by winds from the eight points of the compass for which wind is reported, and by calms, the record covering the entire time of Signal Service observations. To illustrate the manner of constructing the diagrams for each station, the process followed is given for Lynchburg Va.; at this station during April for a period of fifteen years rain was preceded by winds from the several directions, and by calms, as follows:

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
Number of times rain was preceded by winds.....	3	38	12	5	32	21	10	11	20
Normal for April, based on fifteen years' data.....	0.2	2.5	0.8	0.3	2.1	1.4	0.7	0.7	1.3

The normal values, as given in the above table, for April were laid off on lines, drawn from the station as a centre, indicating the eight directions, the scale being one-fourth of an inch for one rain. The extremities of the lines thus laid off were then connected by right lines, thus forming the diagram for each station. The normal obtained for winds preceded by calms is represented by a circle, the radius of which is determined by the number of rains

preceded by calms—one rain being equal to one-fourth of an inch. The scale used in the construction of the diagram is limited, owing to the reduced scale of the map. It should be remembered that these diagrams do not represent directly the actual amount of rainfall at any station, but they show the frequency of rains occurring at any station, and therefore the dimensions indicate indirectly the amount of the rainfall, as will be seen on examining the diagrams on the chart showing the regions of greatest and least rainfall. In the eastern portion of the United States the greatest number of rains are preceded by winds in the southeast quadrant. Some exceptions to this rule, probably due to local cause, will be observed in the Lake region. At several of the Rocky Mountain stations the greatest number of rains are preceded by northerly winds, while the wind chart shows that the prevailing winds in this region are southerly. Over the plateau regions and on the Pacific coast the rain-winds are southerly—generally from south to west.

Chart number viii shows the relative frequency of winds at the several stations of the Signal Service for the month of April from the opening of observation to 1886. The diagrams are constructed in a manner similar to that used in the construction of those on chart number vii, except that the scale used was one-fortieth of an inch for one wind. For example, the data for Lynchburg, Va., during April for a period of fifteen years are as follows:

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
Number of times the wind blew.....	35	224	95	57	183	189	141	195	233
Normal based on fifteen years' data.....	2.3	14.9	6.3	3.8	12.2	12.6	9.4	13.0	15.5